

**What is claimed is:**

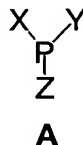
1. A chiral transition metal catalyst, characterized in that at least two structurally different  
5 monophosphorus ligands are bonded to the metal, at least one monophosphorus ligand being chiral.

2. A catalyst as claimed in claim 1, wherein precisely one monophosphorus ligand is chiral.

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3. A catalyst as claimed in claim 1, wherein at least two monophosphorus ligands are chiral.

4. A catalyst as claimed in claims 1 to 3, wherein  
15 the monophosphorus ligands are each independently of the A type



where the X, Y and Z atoms are each independently from the group of carbon (C), nitrogen (N), oxygen (O),  
20 sulfur (S) or halogen (F, Cl, Br, I), to which, according to their number of free valences, further atoms or groups of atoms are bonded independently of one another,

where X, Y and Z may also be connected to one another  
25 by the bonded atoms or groups of atoms,

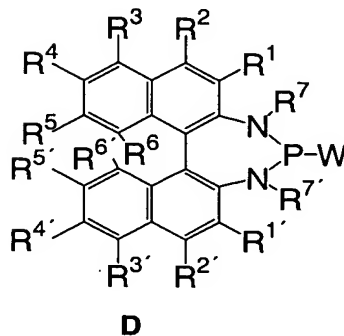
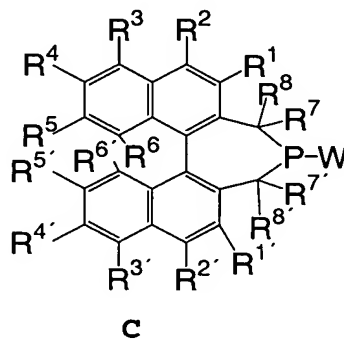
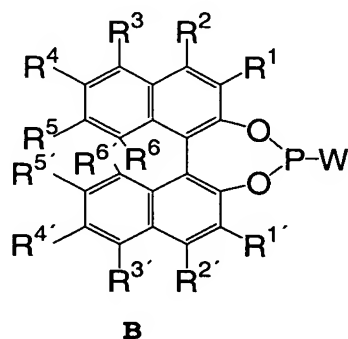
where X-P-Y may also be part of an aromatic system, in which case X is bonded to P by a double bond and there is no substituent Z.

30 5. A catalyst as claimed in claims 1-3, wherein the monophosphorus ligands are phosphines, phosphites, phosphonites, phosphinites, phosphorous triamides, phosphorous monoester diamides, phosphorous diester amides, phosphonous diamides, phosphinous amides,  
35 phosphonous monoester amides, phosphorous halides,

- 29 -

phosphorous diamide halides, thiophosphites, thiophosphorous triesters, thiophosphorous monoester diamides or thiophosphorous diesteramides.

- 5 6. A catalyst as claimed in claims 1-5, wherein the chiral ligands are monophosphorus compounds of the B, C or D type



where W is carbon (C), nitrogen (N), oxygen (O), sulfur (S) or halogen (F, Cl, Br, I), and further atoms or groups of atoms are bonded to W according to its number

- 30 -

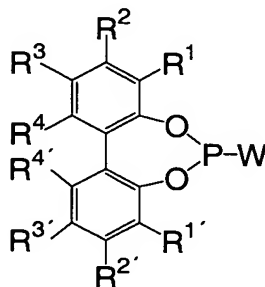
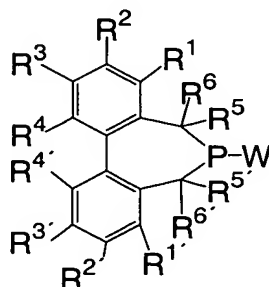
of free valences,

and where the  $R^1$ ,  $R^2$ ,  $R^3$ ,  $R^4$ ,  $R^5$ ,  $R^6$ ,  $R^7$ ,  $R^8$ ,  $R^{1'}$ ,  $R^{2'}$ ,  $R^{3'}$ ,  $R^{4'}$ ,  $R^{5'}$ ,  $R^{6'}$ ,  $R^{7'}$  and  $R^{8'}$  radicals are each independently from the group of hydrogen, halogen, saturated and unsaturated, linear and branched  $C_1$ - $C_{50}$  alkyl,  $C_1$ - $C_{50}$  aryl,  $C_1$ - $C_{50}$  heteroaryl, alkynyl, silyl, nitro, nitrile, ester, carboxyl, carbonyl, amide, amine, hydroxyl, alkoxy, sulfide and selenide groups,

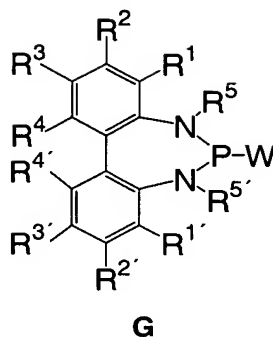
where  $R^1$ ,  $R^2$ ,  $R^3$ ,  $R^4$ ,  $R^5$ ,  $R^6$ ,  $R^7$ ,  $R^8$ ,  $R^{1'}$ ,  $R^{2'}$ ,  $R^{3'}$ ,  $R^{4'}$ ,  $R^{5'}$ ,  $R^{6'}$ ,  $R^{7'}$  and  $R^{8'}$  in turn bear further substituents or may be functionalized,

and where one or more carbon atoms of the binaphthyl skeletons may each independently be replaced by the heteroatoms Si, O, N or S.

7. A catalyst as claimed in claims 1-5, wherein the chiral ligands are monophosphorus compounds of the E, F or G type

**E****F**

- 31 -



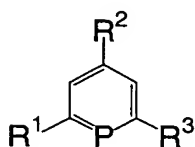
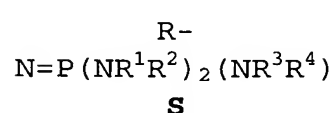
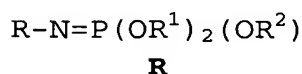
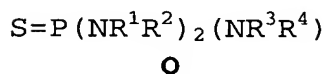
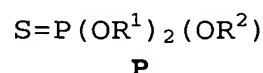
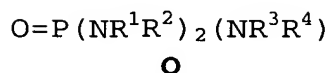
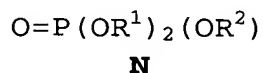
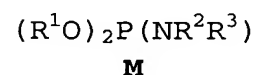
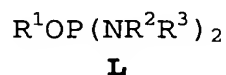
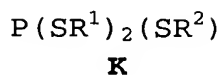
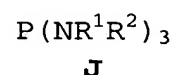
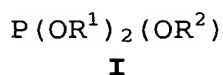
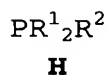
where W is carbon (C), nitrogen (N), oxygen (O), sulfur (S) or halogen (F, Cl, Br, I), and further atoms or groups of atoms are bonded to W according to its number of free valences,

and where the  $R^1$ ,  $R^2$ ,  $R^3$ ,  $R^4$ ,  $R^5$ ,  $R^6$ ,  $R^{1'}$ ,  $R^{2'}$ ,  $R^{3'}$ ,  $R^{4'}$ ,  $R^{5'}$  and  $R^{6'}$  radicals are each independently from the group of hydrogen, halogen, saturated and unsaturated, linear and branched  $C_1$ - $C_{50}$  alkyl,  $C_1$ - $C_{50}$  aryl,  $C_1$ - $C_{50}$  heteroaryl, alkynyl, silyl, nitro, nitrile, ester, carboxyl, carbonyl, amide, amine, hydroxyl, alkoxy, sulfide and selenide groups,

where  $R^1$ ,  $R^2$ ,  $R^3$ ,  $R^4$ ,  $R^5$ ,  $R^6$ ,  $R^{1'}$ ,  $R^{2'}$ ,  $R^{3'}$ ,  $R^{4'}$ ,  $R^{5'}$  and  $R^{6'}$  in turn bear further substituents or may be functionalized,

and where one or more carbon atoms of the biphenyl skeletons may each independently be replaced by the heteroatoms Si, O, N or S.

8. A catalyst as claimed in claims 1-7, wherein at least one achiral ligand is a monophosphorus compound of the H-T type

**T**

where the  $\text{R}^1$ ,  $\text{R}^2$ ,  $\text{R}^3$  and  $\text{R}^4$  radicals are each independently from the group of hydrogen, halogen, saturated and unsaturated, linear and branched  $\text{C}_1$ - $\text{C}_{50}$  alkyl,  $\text{C}_1$ - $\text{C}_{50}$  aryl,  $\text{C}_1$ - $\text{C}_{50}$  heteroaryl, alkynyl, silyl, nitro, nitrile, ester, carboxyl, carbonyl, amide and selenide groups, where  $\text{R}^1$ ,  $\text{R}^2$ ,  $\text{R}^3$  and  $\text{R}^4$  in turn bear further substituents, and may be functionalized or bridged.

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9. A catalyst as claimed in claims 1-8, wherein the transition metal is a metal of groups **IIIb**, **IVb**, **Vb**, **VIb**, **VIIb**, **VIII**, **Ib** or **IIb** of the periodic table or a lanthanide or actinide.

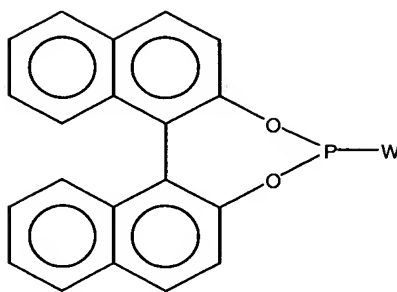
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10. A catalyst as claimed in claim 9, wherein the transition metal is Rh, Ir, Ru, Ni, Pd or Pt.

11. A catalyst as claimed in claims 3-10, wherein the chiral monophosphorus ligands used are at least two ligands of the

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- 33 -



type where W is each independently  $\text{CH}_3$ ,  $\text{C}(\text{CH}_3)_3$ ,  $\text{c-C}_6\text{H}_{11}$  or  $\text{OCH}_3$ .

- 5 12. A process for catalytically preparing chiral organic compounds, characterized in that the chiral organic compounds are prepared in a chemical reaction from prochiral organic compounds in the presence of a transition metal catalyst as claimed in claims 1-11.
- 10 13. The process as claimed in claim 12, wherein the chemical reaction is a hydrogenation.
14. The process as claimed in claim 12, wherein the
- 15 15. The process as claimed in claim 12, wherein the chemical reaction is a hydroformylation.
- 16 15. The process as claimed in claim 12, wherein the chemical reaction is a hydroboration, hydrosilylation, hydrovinylation, hydroamination, epoxidation,
- 20 15. The process as claimed in claim 12, wherein the chemical reaction is a hydroboration, hydrosilylation, hydrovinylation, hydroamination, epoxidation, hydroxylation, aminohydroxylations, substitution, allyl substitution, Heck coupling, Stille coupling, Suzuki coupling, Negishi coupling, Michael addition, aldol addition, Diels-Alder reaction, cyclopropanation, CH insertion reaction or 1,3-dipolar cycloaddition.

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